

WHAT IS CLAIMED IS:

1. A birefringence measuring apparatus,
comprising:

5 a light projecting unit for projecting
approximately circularly polarized light upon a
sample;

a Stokes meter for detecting a state of
polarization of light from the sample; and

10 calculating means for calculating
birefringence of the sample on the basis of a
Stokes parameter from said Stokes meter.

2. An apparatus according to Claim 1,
wherein said light projecting unit includes a
15 light source and converting means for converting
light from the light source into approximately
circularly polarized light.

3. An apparatus according to Claim 2,
20 wherein said converting means includes a phase-
difference plate.

4. An apparatus according to Claim 2,
wherein the light from the light source has a
25 wavelength not greater than 370 nm.

5. An apparatus according to Claim 2,

wherein the light from the light source has a wavelength not greater than 200 nm.

6. An apparatus according to Claim 1,
5 further comprising a dividing unit including three optical elements having the same reflection characteristic and the same transmission characteristic.

10 7. An apparatus according to Claim 1, wherein said calculating means calculates the birefringence of the sample on the basis of the following equations:

$$B = \frac{\pi}{2} - \arcsin\left(\frac{S_3}{S_0}\right)$$

15
$$\phi = -\frac{\pi}{4} + \frac{1}{2} \arctan\left(\frac{S_2}{S_1}\right)$$

where B is the amount of birefringence, ϕ is a phase advance axis angle, $S_0 - S_3$ are Stokes parameters wherein S_0 is a total light quantity, S_1 is a horizontal linear polarization component,
20 S_2 is a +45 degree linear polarization component, and S_3 is a clockwise circular polarization component.

8. An apparatus according to Claim 1,
25 further comprising a memory for memorizing

birefringence measured by said birefringence
measuring apparatus without a sample, wherein said
calculating means calculates the birefringence of
the sample also on the basis of the birefringence
5 memorized in said memory.

9. A birefringence measuring apparatus,
comprising:

10 a light projecting unit for projecting
approximately circularly polarized light upon a
sample;

a plurality of light receiving portions
for detecting a light quantity of light from the
sample; and

15 calculating means for determining a
Stokes parameter on the basis of detected values
at said plurality of light receiving portions, and
for detecting birefringence of the sample on the
basis of the Stokes parameter.

20

10. A birefringence measuring apparatus,
comprising:

25 a light projecting unit for projecting
approximately circularly polarized light upon a
sample;

a plurality of light receiving portions
for detecting a light quantity of light from the

sample;

a memory for memorizing birefringence
measured by said birefringence measuring apparatus
without a sample; and

5 calculating means for detecting
birefringence of the sample on the basis of
detected values at said plurality of light
receiving portions and the birefringence memorized
by said memory.

10

11. A birefringence measuring apparatus,
comprising:

light projecting means for projecting
approximately circularly polarized light upon a
15 sample;

at least one dividing unit for dividing
output light from the sample into two light beams
having the same polarization state;

at least one polarizer;
20 at least one phase-difference plate;
at least two light receiving portions;
and

calculating means for calculating a
quantity of received light at said at least two
25 light receiving portions.

12. A birefringence measuring apparatus,

comprising:

light projecting means for projecting approximately circularly polarized light upon a sample;

5 at least one dividing unit for dividing output light from the sample into two light beams having the same polarization state;

at least one polarizer;

at least four light receiving portions;

10 and

calculating means for calculating a quantity of received light at said at least four light receiving portions,

wherein the birefringence of the sample
15 is measured without rotating the sample and said at least one polarizer.

13. A birefringence measuring apparatus,
comprising:

20 light projecting means for projecting approximately circularly polarized light upon a sample;

at least two dividing units for dividing output light from the sample into two
25 light beams having the same polarization state;
and

four light receiving portions,

wherein a first light beam having the same polarization state as the output light from the sample is incident on one polarization dividing means whereby the first light beam is
5 divided into two light beams having two orthogonal polarization components which beams are then received by light receiving portions, respectively, wherein, regarding a second light beam having the same polarization state as the output light from
10 the sample, a polarization component different by 45 deg. from the two orthogonal polarization components is detected by a light receiving portion through a polarizer, and wherein, regarding a third light beam having the same
15 polarization state as the output light from the sample, only a circular polarization component is detected by a light receiving portion through a phase-difference plate and a polarizer, whereby the amount of birefringence of the sample is
20 measured.

14. A birefringence measuring apparatus, comprising:

light projecting means for projecting
25 approximately circularly polarized light upon a sample;

at least three dividing units for

dividing output light from the sample into two light beams having the same polarization state as the output light from the sample; and

four light receiving portions,

5 wherein a first light beam having the same polarization state as the output light from the sample is incident on a first polarizer, and a first polarization component is detected by a first light receiving portion,

10 wherein a second light beam having the same polarization state as the output light from the sample is incident on a polarizer, and a second polarization component orthogonal to the first polarization component is detected by a
15 second light receiving portion,

 wherein a third light beam having the same polarization state as the output light from the sample is incident on a polarizer, and a third polarization component being different by 45 deg.
20 from the first polarization component is detected by a third light receiving portion, and

 wherein a fourth light beam having the same polarization state as the output light from the sample is incident on a phase-difference plate
25 and a polarizer, and a circular polarization component is detected by a fourth light receiving portion, wherein the amount of birefringence of

the sample is measured.

15. A method of measuring birefringence,
comprising the steps of:

5 projecting approximately circularly
polarized light upon a sample;

 detecting a light quantity of light
from the sample;

 determining a Stokes parameter on the
10 basis of the detection of the light quantity; and

 detecting birefringence of the sample
on the basis of the Stokes parameter.

16. A method according to Claim 15, wherein,
15 in said birefringence detecting step, the
birefringence of the sample is detected also on
the basis of birefringence measured without a
sample.